ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1903.

I.—BLUE GUM.

(*Eucalyptus Globulus*, Labill.)

Few plants have been the cause of more disappointment than the Blue Gum. This has arisen from excessive trust in it as an empirical remedy for an evil without sufficient knowledge of the real nature of the evil or what it depended on.

The Blue Gum is a native of Victoria in Australia and of Tasmania. It grows with readiness and rapidity in warm temperate countries but is not adapted to a cooler climate. In its juvenile form it is often to be seen in our gardens as a decorative plant in summer, but can only endure our winter in the warmest parts of our South Coast.

In 1873 a paper by Mons. Gimbert appeared in the *Comptes rendus* for Oct. 6 (pp. 764–5) on the "Sanitary improvements of marshy districts by means of *Eucalyptus Globulus*." Of this, the following is a translation :—

"According to documents which come to us on all sides and from the most reliable sources, it appears to be an established fact of Hygiene and Agriculture, that Intermittent fever disappears wherever *Eucalyptus Globulus* prospers. A tree which grows with incredible rapidity, and can absorb in the soil ten times its own weight of water in twenty-four hours, and diffuses in the atmosphere camphorous antiseptic emanations, must certainly play a very important part in the amelioration of miasmatic countries. Thanks to these singular properties, it could pump water directly and rapidly from marshy surfaces, prevent the fermentations which are produced there, and paralyze, by means of its emanations, the organic miasma which might arise therefrom. These anticipations, announced in 1869, are

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being daily realised. It will suffice to record here some of the numerous results of sanitary improvement produced by this plant to convince the reader.

"The English first experimented with sanitary plantations in the Cape Colony. In two or three years they have changed the climatic conditions and the aspect of the unhealthy regions of this possession. Some years afterwards the Algerians planted *Eucalyptus* in our part of Africa. The following are some of the results obtained :—

"At Pondouk, 32 kilometres from Algiers, says M. Trottier, I possessed a property, the house of which was situated near the river Hamyze, which by its emanations gave ague every year to the farmers and their servants. In the spring of the year 1867 I planted on this farm 13,000 *Eucalyptus Globulus*. In July, 1867, the season at which the fevers begin to rage, the farmers enjoyed a complete immunity. The trees, however, were scarcely 2 or 3 metres in height. From that time the resident population has been exempt from fevers."

"The farm of Ben-Machydlin in the neighbourhood of Constantine was, some years since, noted for its insalubrity. It was covered with marshes in winter and summer. To-day all this has disappeared. 14,000 plants of *Eucalyptus* have in five years completely dried the soil. They constantly exhale into the atmosphere aromatic vapours ; the farmers no longer have fever ; their children are the picture of health and vigour. The factory at Gué de Constantine was surrounded by a marsh, the pestilential emanations of which rendered the use of the establishment impossible during summer. The idea occurred to M. Sauliève of sowing in these marshes a great quantity of *Eucalyptus*. In three years five hectares of boggy land were converted into a magnificent park. The water had been literally drunk up by the trees, and the workmen no longer had fever.

"The same hygienic revolution occurred in consequence of extensive plantations of *Eucalyptus Globulus* on the farm of La Maison-Carrée, situated in the same neighbourhood, and in which the inhabitants frequently succumbed to ague. These great and rapid successes are recorded in a Report drawn up by an Agricultural Jury, and are consequently by no means the result of individual prepossession. Residents in Cuba, upon whose statements we can rely, have assured us that in the unhealthy districts of the island in which they have been planting *Eucalyptus* for some years, malarious diseases have disappeared.

"According to Ramel, Australia is salubrious where *Eucalyptus* prospers, pestilential in places where the tree does not exist.

"On the banks of the Var there is near the railway-bridge a caretaker's house adjoining the embankment which was made to narrow the river before building the bridge. This lodge was pestilential. Every year the caretaker, whose health was ruined by the malaria, had to be changed.

"M. Villard, engineer of the railway, had forty trees planted two years ago near the house. From that year, the employés were protected from fever, and since that time this post has been one of the healthiest in the country.

"The above account renders it unnecessary for me to dilate further on the importance of similar results. I shall be satisfied if I succeed in inducing either private individuals or the Government to make use of this process of sanitary improvement."

It is to be observed that M. Gimbert attributes the sanitary effect of the Blue Gum to two causes: (i) the effective drainage of marshy soil resulting from the rapid growth of the trees and the constant transpiration from the leaves of the water taken up by the roots; the influence of their "antiseptic emanations" on the "organic miasma" to which at that time malaria was attributed.

As to the first, the facts were undoubted. As to the second, the statements were purely hypothetical, and Kew preserved an attitude of discreet scepticism. Notwithstanding a "boom" for planting Blue Gum and other species of *Eucalyptus* spread over the world. An attempt was made at great expense to correct the unhealthiness of the Messaria Plain in Cyprus by planting young *Eucalyptus* trees, to be promptly killed by the first frost.

Doubt, in fact, was from time to time thrown on many of M. Gimbert's facts, and the value of planting Blue Gum in combating malaria became more than doubtful.

In a letter to the *British Medical Journal* (Sept. 27, 1884), Dr. L. Aitken, of Rome, denied the correctness of the statement that had been repeated over and over again, that the sanitary state of the neighbourhood of that city had been improved by the planting of *Eucalyptus* trees. Except at Tre Fontane, he says, where the unpaid labour of monks and convicts keeps the trees alive, the experiment of planting the Campagna has proved a costly failure, only three or four per cent. of the trees planted under the conditions attending the plantation of other young forest trees having survived. Even at Tre Fontane the Government has found it necessary to restrict the amount of convict labour which it at first placed at the disposal of the Trappist monks for planting operations, in consequence of the sickness among the warders and convicts. The monks themselves, too, are known still to succumb to malaria, though Dr. Aitken more than hints that the whole truth is not made public, lest it should affect the sale of the Eucalyptus elixir which is prepared at the monastery and adds materially to its revenue. Dr. Aitken does not deny that the deaths from severe malarial fevers have decreased during the last year or two, but apart from the fact that this may be due to fluctuations in the intensity of the malarial poison, he is inclined to attribute any slight improvement which may be claimed quite as much to the necessary subsoil draining and preparation of the ground as to any influence of the young gum trees.

M. Charles Rivière, Director of the Jardin d'Essai at Algiers, wrote as follows in 1885 (*Bull. de la Soc. Nat. d'acclim. de France*, Jan., pp. 17–18):—

"I think I ought to call the attention of the Minister of Marine to some exaggerations with which public opinion has been pleased to invest the qualities of this Australian tree, especially from a hygienic point of view. Many of the legends published about this arborescent Myrtacea do not at present rest on any scientific

basis confirmed by experience. It is of the highest importance therefore, to state the truth on this question, or at least to suggest a doubt seeing that it involves the development and prosperity of our colony of the Gaboon.

" Dr. Tommasi-Crudeli, member of parliament, one of the most competent men both from his theoretical and practical knowledge to discuss the question, has lately shown, in his report to the Italian Minister of Agriculture, that the history of the *Eucalyptus* plantations formed at the farm of Trois-Fontaines, in the Roman Campagna, exhibit the singular fact that, during 1882, the dangerous fevers were actually confined to this locality which was considered to have been rendered healthy for a long time previously, and the convicts employed in the establishments had to be withdrawn.

" Professor Liversidge, of the University of Sydney, in Australia, has drawn attention to the fact that, for many years, fevers have prevailed with great intensity in the *Eucalyptus* forests of that country, their native land.

" Finally, Dr. Tommasi-Crudeli gives the same result in the case of the plantations in Algeria. Having superintended very large plantations of *Eucalyptus* in Algeria, from Tunis to Morocco (of which several are about fourteen years old) I admit that their success as vegetation is moderately satisfactory. It is incontestable that many large groves of trees now replace depressions formerly marshy, but it would be impossible to affirm that they have had a febrifugal action. The example of Lake Fetzara has been much quoted ; its marshy miasma infected the large mining works of Mokta-el-Hadid, decimated the staff, and rendered existence in this locality insupportable. Now, thanks to well developed forests of *Eucalyptus*, it presents all the conditions of a tolerable hygiene. As I first planted these unhealthy slopes and took an active part in the development of some hundreds of thousands of trees, I can readily show how manifest an error it would be to attribute entirely to the *Eucalyptus* effects the cause of which is to be sought elsewhere. The *Eucalyptus* plantations have isolated by a curtain of foliage the lake from the works. The material prosperity of the management of the mine has extended itself to the staff ; the means of existence have been easier of attainment, the medical attendance better secured, and, what is of most importance, the greater part of the staff is conveyed to the mine every morning and taken back in the evening by the first and last trains to Bône, 36 kilometres off, that is to a sea-side town constantly swept by the sea-breezes.

" The prophylactic action of the *Eucalyptus* is then far from demonstrated in fever stricken countries; and there cannot *à priori* be any reason to believe in its direct action, when one remembers the extreme resistance of all these bacteria to the most violent antiseptic agents."

Blue Gum proved, as might have been expected, quite unsuited for planting in tropical countries.

Mr. Horne, Director of Forests and Gardens, reported in 1886 :—

" The blue gum, *Eucalyptus Globulus*, is a useless species for Mauritius and should not be planted except as a garden plant,"

Nevertheless public opinion was still in favour of *Eucalyptus*-planting, and forest and other officers were practically compelled to devote money to it which might have been more profitably employed.

Mr. Gamble wrote [*Progress Report of Forest Admin., Northern Circle, Madras*, 1888–9] :—

"The Conservator has no faith in the endeavour to acclimatize the various species of *Eucalyptus* in the Indian plains. Doubtless, and as these trials show, a few plants can be reared if treated very carefully, garden-fashion, and at some expense, but that is not what the Forest Department aims at. What we require are trees that can be grown easily and cheaply and on poor soil (for we have very little good soil indeed and what there is is mostly already covered with fine indigenous timbers of far greater value than those of the Eucalypti) in dry and rocky places, and it is a pity to waste money and time on such experiments when they might be applied so much more advantageously to works which we know are likely to succeed and pay, directly or indirectly" (p. 38).

Mr. Cameron, Superintendent of the Government Botanical Gardens, Bangalore, reported to the same effect in 1890. He thought, however, that *E. citriodora* might take the place of *E. Globulus* in combating malaria.

"The blue gum experiments have proved conclusively that this tree is not adapted to the plains of India. At Bangalore it attains a height of 15 to 20 ft. and then dies out. We have been much more successful with the species *saligna*, *rostrata*, *marginata*, and *citriodora*, all of which are established in the gardens and furnish seeds for local use and general distribution. Numerous species of Eucalypti have been tried at intervals, but excepting those mentioned above, the genus is better adapted to the hills than the maidan. The success attained at Ootacamund is encouraging and indicates that *E. Globulus*, as well as other species, will succeed in the higher altitudes of the Bababudan hills, should their acclimatisation be desired at any time. Fast growing trees of the class are important as a possible source of fuel for railways and mills. *E. citriodora* is a desirable tree to plant in the vicinity of swamps, or in villages that are infested by malarial fever, the fragrance arising from its foliage and bark being a powerful deodoriser."

We owe to Crudeli and Klebs the abandonment of the old theory of an "organic" or "paludine miasma." For this they substituted that of an organism which established itself in the blood of malarious patients.

The following interesting account of the position in 1894 is reproduced from the *United States Consular Reports* for September of that year. It, at any rate, gave the final *coup de grâce* to the value of blue gum.

"Before considering the hygienic effects of *Eucalyptus* plantations with reference to malaria, it may not be irrelevant to present the views of the distinguished Italian professor, Tommaso Crudeli, now senator of the Kingdom, on malaria. He has made exhaustive investigations as to the origin of the scourge, and was the

first (1879), together with Klebs, to discover the microbe of malaria—the *Bacillus malariæ*. In 1885 Crudeli published his important and interesting work, 'The Climate of Rome.' It is indispensable, he says, to form an exact idea of malaria and of the conditions in which it is produced, to free the mind from the prejudice that has taken possession of the medical fraternity, as well as of the laity, that malaria can only be produced from stagnant water, resulting from the putrefaction of dead vegetable and animal organisms contained therein. It was thought that a step forward had been made when the morbific ferment that produces malarial infection was called paludine miasma; but the reverse was true. Italians use the word malaria to indicate the specific agent of intermittent and pernicious fevers. Italy has enjoyed the unenviable privilege of sending this word around the world and causing it to be received into every language. It has at least the advantage of not prejudicing any opinion with regard to the nature and production of this specific agent. It only specifies an established fact, namely, that this agent diffuses itself in the atmosphere, making it capable of infecting human organisms into which it may have been introduced by respiration.

"Malaria is produced in the soil and not in water. The *sine quâ non* of the production of malaria is the presence of malarial ferment in the soil. Soils that do not contain this ferment may possess every possible form of saturation by water, which, in turn, may contain all possible forms of putrefaction, but there will be no production of malaria. Water is undoubtedly an indispensable factor of this mischievous product, because if malarial soil is not kept moist during warm weather, it is incapable of producing malaria. Hence, all other conditions being equal, malarial soils containing stagnant water are, by right, considered the most dangerous, because in them is always found the humidity indispensable to the hurtful product, even during the driest summers. But it is by no means necessary that the soil should be marshy in order that malaria shall be produced. Were such the case, Italy would be a much more fortunate country than it is, because at least two-thirds of its malaria-producing soil would be perfectly healthy. But little humidity is required to awaken malaria in soil that contains its germ, and we frequently meet with soil in valleys, on hill-sides, and on mountains whose surface is arid during summer, but gives off malaria owing to the slight humidity held in the subsoil. Nay, it can happen, and often does happen, that accumulations of water on the surface of a malarial soil prevent the specific poisoning of the atmosphere. This always happens when the water covers the infected soil uniformly. A film of water interposed between the malarial-producing soil and the atmosphere operates as an obstacle to malarial germs and protects the atmosphere of the locality from contamination.

"Malaria-producing soils are to be met with in nearly every part of the globe. With the exception of localities situated beyond the polar circles, no part of the globe is known in which malaria may not make its appearance in a greater or lesser degree. What is worse is that, with the exception of solid rock, we know of no soil that can be, *a priori*, declared to be incapable of generating this infection of the atmosphere. Malaria is produced from soils

of the most varied composition and of the most varied exposure—in low places rich in water and organic substances, in soils of volcanic origin, as well as in sedimentary soils of every geological period, and even in soils composed of sandy quartz. Next to the septic ferment the malarial ferment is, of all the disease-breeding ferments, the most widely disseminated, and that which most readily finds conditions suited to its development and propagation. What is this ferment? Prof. Crudeli declares it to be an organism, the microbe of malaria, the *Bacillus malariæ*. This organism dwells in the soil; but a minimum temperature of 68° F., a certain amount of moisture, and the action of the atmosphere on the soil in which it is contained are necessary for its development; so that it is possible to prevent its spreading by interrupting the communication of the soil with the atmosphere, either by covering it with water or by grasses the roots of which would constitute, as it were, an impervious mat.

"Prof. Crudeli remarks that sections of the city of Rome, which were covered by parks and gardens a few years ago, and which were very malarious, have become very healthful, owing to the lands being now covered by buildings and the new streets paved, all contact of the air with the soil being thus shut off.

"From the days of Varro it has been surmised that this ferment was derived from a living organism; but it was only in 1879 that Crudeli and Klebs took up the investigation of a great number of malarial soils, dry as well as marshy. They cultivated the very smallest organisms found in these soils, experimenting with the products of these cultures on animals; analyzed the blood and organs of men and animals infected with malaria, and established, beyond all doubt, the existence of a living parasite. This parasite attacks the red globules of the blood and destroys them after having produced in them a series of characteristic alterations which indicate with certainty the existence of malarial infection.

"The effects of malaria are suspended by covering the ground with buildings or by sowing the land in grasses, thus preventing the contact of the atmosphere with the soil, and by drainage, that is, by removing the moisture from the soil.

"But, as man does not control the rain, it is evident that after a rain even a drained soil will give off malaria, unless that soil is cut off from contact with the atmosphere. In order to drain certain portions of the Roman Campagna, the experiment has been tried of planting trees that would absorb a great quantity of water from the soil. With the preconceived idea that malaria is due to putrid decomposition in marshy ground, it has been proposed to make this attempt by means of the *Eucalyptus*. It was thought that these trees of rapid growth would dry up marshy lands and destroy, at the same time by means of the aroma of their leaves, all miasmatic emanations.

"Up to date (1886) not a single instance of hygienic improvement by the sole means of *Eucalypti* has been ascertained, but the possibility of so doing is not denied. It can be admitted that these trees sometimes prove useful in certain malarial soils. I frankly maintain, however, that frequently they are of no use whatever, and that it is well to guard against exaggerations that often blind the judgment.

"It would have been possible to avoid these exaggerations and the disappointments which followed as a consequence if, instead of regarding these plantations from a theoretical point of view, the public had begun by studying their results in the very home of the *Eucalypti*. It would then have been known in time that even in the southern hemisphere, where the *Eucalypti* thrive better than with us, there are forests of *Eucalypti* in which malaria reigns supreme, as has been stated by Prof. Liversidge, of the University of Sydney. In Italy, although the newspapers had persuaded everyone that the farm of the 'Tre Fontane,' near Rome, had become healthful by means of the *Eucalypti*, it proved a disagreeable surprise to learn of a sudden outbreak of malaria in 1882 that caused much sickness among the farm hands, while the rest of the Campagna remained particularly healthful.

"The experiments with the *Eucalypti* at 'Tre Fontane' are interesting and instructive. On the road to Ostia, at about 3 miles from Rome, is situated the abbey of the 'Tre Fontane.' There is a monastery of Trappist monks there, who, for many years, have been endeavouring to improve the land adjacent to the monastery by means of setting out extensive vineyards, draining the soil and planting the *Eucalyptus*. It was reported that the hygienic condition of the locality had been much improved, and this improvement was ascribed by the public and the Government to the planting of the *Eucalyptus* by the Trappists; hence it was decided to extend the setting out of these trees.

"To facilitate this experiment, the Government in 1880 established an agricultural colony of penitentiary convicts and put them in quarters near the monastery, that is, on that part of the farm supposed to have already been improved by the *Eucalypti*. The convicts were surrounded by hygienic conditions far superior to those of the agricultural labourers of the Campagna, and, notwithstanding this, nearly all the convicts were taken down with malarial fever, more or less severe, in 1880. The Trappists started the setting out of the *Eucalyptus* in 1870.

"During the summer and autumn of 1882, all of the inhabitants of the 'Tre Fontane' were attacked. The Trappists, it would seem, suffered from slight attacks, but all suffered. Some of the convicts had slight and some severe attacks. Nearly every guard had a severe attack; the guards had all to be changed. There were no deaths because medical assistance was at hand. The fever-striken patients were well cared for in one of the hospitals of Rome.

"In January, 1883, Prof. Crudeli (then a deputy, now a senator) called upon the Government to suspend all work during the sickly season. He had noticed that the guards suffered more from malaria than the convicts. He thinks that the convicts, while at labour, threw off some of the evil effects of the malaria, while the guards, remaining stationary, inhaled and retained in their systems more malaria than the convicts.

"If to the reasonable doubts as to the hygienic effects of the *Eucalypti* is added the uncertainty of their thriving, it follows that all this enthusiasm for the *Eucalyptus* tree is in no wise justified. The tree is most capricious. As it is full of sap during the winter of our hemisphere, it is frequently killed by a freeze,

by late spring frosts, and by other causes that botanists have not yet fully determined. In localities where the winters are mild and the soil deep, this tree grows too rapidly and is easily split by winds of moderate velocity. It should also be borne in mind that it is frequently very expensive to grow this tree. For instance, if the soil be very wet, it is necessary to drain it; otherwise the roots of the tree rot. If, on the other hand, the soil be very stiff, it is necessary to dig deep holes to make room for the roots, which holes require to be drained to prevent water from standing in them and rotting the roots. It is, therefore, more prudent to hold to methods less uncertain, and when the condition of a locality indicates the advisability of planting trees for the absorption of moisture, it is better to set out trees belonging to our hemisphere. It is less expensive, and there is less likelihood of the trees dying.

"One of the most generally accepted theories is that forests produce malaria independently of the quality of the soil which they cover. On every hand we meet with forests in which the production of malaria is most abundant, and we find on every hand vast tracts of country which remained uninhabited by reason of malaria so long as they were wooded and that became more or less completely healthful upon being cleared. These facts are interpreted as showing that malaria is produced in the forests by the putrefaction of the leaves, branches, and dead insects that become accumulated on the ground and there slowly decompose. But such an explanation cannot stand, because, were such the case, we ought to meet with malaria in every forest of the world, where decomposition of organic detritus occurs, whereas, on the contrary, many forests are free from malaria. Forests are factors of malaria in an indirect way only; they do not produce it themselves, but favour its development whenever they cover lands that are malarial. They intercept the solar rays, and hence prevent an active evaporation from the soil, so that it retains a great deal of humidity in the warm season. If the soil does not contain the malarial ferment, the forest is not infected and *vice versâ*. Malarial forests are frequently met with in nature, and the clearing away of these forests has rendered the localities occupied by them much more healthful, if not entirely so.

"Dr. Montechiare, a practising physician of Rome who for years was physician to the penal colony at "Tre Fontane," tells me that his experience justifies him in declaring that no beneficial result against malaria has been derived from the planting of the *Eucalyptus*. The monks set out no less than 50,000 trees on a few acres. Had the efficacy of the *Eucalyptus* proven real, the entire settlement of the "Tre Fontane" would have become a veritable Eden on account of its wholesome, balsamic air, which has by no means been the case. In 1870, Dr. Montechiare, being in charge of St. John's Hospital, experimented with all the preparations of *Eucalyptus* against malarial fever, and found that not one lowered the temperature of the patient by a tenth of a degree. The only value of the elixir of *Eucalyptus* consists in the alcohol that it contains. The efficacy of the *Eucalyptus* for the improvement of the air is no greater than that of the elm, pine, and mulberry. If it recommends itself by its rapidity of growth, the trees just mentioned recommend themselves by being hardier and more easily grown.

"Professor (now Senator) Torelli has also written on the subject of the *Eucalyptus*. He sums up by declaring that the much-vaunted merits of the *Eucalyptus* have not been established.

"The *Eucalyptus* is killed by the cold when the thermometer marks 12° F. below freezing. The species that have shown the greatest resistance to cold are the *Globulus* (blue gum), *viminalis* (swamp gum), *rostrata*, *robusta*, *meliodora*, *resinifera* (red gum), *paniculata*, *saligna*, *coriacea*, and *cornuta*.

"*E. Globulus* is considered by all as the species that possesses hygienic properties in the highest degree, *resinifera* coming next. Marquis Garzoni has succeeded in growing the prodigious number of 93 species on his farm near Viareggio, Italy.

WALLACE S. JONES,
Consul-General."

"Rome, March 19, 1894.

That malaria is produced by the presence of an organism in the blood is now undoubted. But this is not *Bacillus malariæ* as supposed by Crudeli, but one which is rather animal than vegetable. The true parasite was observed in 1880 by Laveran, a French Army Surgeon serving in Algeria. It is to Manson and Ross we owe the demonstration of the fact that it is carried by mosquitoes to healthy persons from those who are suffering from the disease. It has been proved that persons efficiently protected from mosquito-bites escape its attacks, even in the most malarious districts.

Malaria is therefore not due to an "emanation" in the air or to something derived from either soil or water, but to a blood parasite carried from one individual to another. We now see that the attempt to check it by planting any kind of *Eucalyptus* was futile. In some cases it may indirectly have done good : (i.) by drying up pools in which mosquitoes breed ; (ii.) by forming a screen which stopped their flight. In others there is reason to think that it actually did harm. At the request of the Government of Lagos a good deal of trouble was taken to introduce tropical species into the colony. But it was found that buildings near which they were planted actually became malarious. The tree harboured mosquitoes which otherwise the sea breeze would have blown away.

And unfortunately the wholesale planting of Blue Gum has not been rewarded by the production of useful timber. As the results of his experiments at the Californian University, Berkeley, California, Professor Hilgard stated :—

"The *Eucalyptus* is a fast growing tree, but when it comes to the utilisation of the wood, the fast growing gum is a failure. It is fit for firewood only." (*Cape Agricultural Journal*, Nov. 1, 1894.)

The moral of the whole story is the unwisdom of relying on a plausible nostrum for the remedy of an evil without accurate knowledge of its cause.

II.—KEW IN THE EIGHTEENTH CENTURY.

Kew, as a scientific establishment, dates from 1759, when a Botanic, or as it was then called a Physic, Garden was established by the Princess Augusta of Saxe-Gotha, Dowager Princess of Wales.

It was energetically maintained by her son, George III., with the scientific assistance of Sir Joseph Banks, who was virtually, for the greater part of his life, Director. Under his advice collectors were sent to all parts of the world. The first New Holland plants were introduced during Cook's voyages, 1768–80. At Sir Joseph Banks' instance the system of inter-colonial exchange through Kew was commenced, which has been maintained ever since. The most memorable undertaking of this kind was the voyage of the "Bounty" (1787) for the purpose of introducing the bread-fruit tree from the South Seas into the West Indies. Nelson, the Kew collector, was amongst those sent adrift by the mutineers, and eventually died of the exposure.

Sir Joseph Banks' papers and correspondence virtually comprised the early archives of Kew till his death in 1820. It is much to be regretted that after being deposited for many years in the British Museum they were eventually dispersed. From time to time small parcels which have come into the market have been purchased for the Library of the Royal Botanic Gardens, Kew.

The following interesting letter was acquired in this way. It bears eloquent testimony to Sir Joseph Banks' wise and untiring activity :—

Mr. Henry Shirley to Sir Joseph Banks.

Kingston, Jamaica,
20th December, 1794.

Sir,

The Committee appointed by the House of Assembly of this island for superintending the public Botanical Gardens, being sensible of the share this country enjoys in the general advantages derived from your zeal and abilities, as well as of the interest you take in our success, particularly with respect to the valuable collection of plants lately received, have directed me to communicate to you such particulars concerning them as may tend to give you a just idea of their actual condition, appearance, and progress. It is, therefore, with great pleasure I take the opportunity of complying with their desire, by informing you that the bread-fruit plants (*Artocarpus incisa*, L.) are thriving with the greatest luxuriance in every part of the island, particularly in the parish of St. Thomas-in-the-East ; the nursery at Bath contains 40 of those which were chosen as the strongest and most forward plants, and the largest of them now measures 15 feet in height and 17 inches in circumference round the stem ; all the others are beautiful, strong, healthy, and bushy trees, just now beginning to throw up suckers from the roots, and likely to produce fruit in a short time. There are 15 bread-fruits on Holland Estate, in

Plantain Garden river, which are making an equal progress, the largest measuring 13 feet high and 11½ inches in circumference round the stem. The Botanic Garden in Liguanea contains 20 plants, which, notwithstanding the inferiority of the soil of that parish, are thriving exceedingly well; the largest is a beautiful bushy plant 7 feet 9 inches high and 7½ inches in circumference of stem; 28 plants have been propagated by layers from the two gardens, and some gentlemen in the Leeward parishes have succeeded in striking several cuttings.

The Ayyah (*Eugenia malaccensis*) and Rattah (*Inocarpus edulis*) of Otaheite, are in a very flourishing state in various parts of the Island, particularly in the Liguanea Garden and the Nursery at Bath: 16 plants of the Ayyah have been cultivated by layers and cuttings.

Eight plants of the Avee (*Spondias mangifera*) were landed in tolerable health from the Providence, all of which are since dead, but there are several plants of a variety of the Avee in the Botanic Garden of Liguanea, which were imported at the same time with the Mangos and Cinnamons, some of them, however, are not in a very thriving state, and this variety is much inferior to the Otaheite kind.

The Mattee and Ettow (*Cordia Myxa*), dye plants of Otaheite, have succeeded wherever they have been planted; 38 of the former have been raised by layers.

The Peeah (*Tacca pinnatifida*) of Otaheite just keeps alive in this country; it has been tried in various soils and situations, but without success.

The Vahee, or large red plantain of Otaheite (*Musa sapientum*) has produced eight fine suckers, but has not yet fruited there are also several suckers from the Oriah, which appears to be the same as the common maiden plantain of this country.

All the Timor plants, as well as those in the Botanic Garden of Liguanea, as in the Nursery at Bath, are making a very rapid progress; 45 plants of the Jambolan (*Eugenia Jambolana*) and 36 of the Lemon China have been propagated by layers.

The Nanka or East India Jaack (*Artocarpus integrifolia*) is in a very forward state, and appears a different variety of that already bearing fruit here.

The Cherimailha (*Anona Cherimolia*) and Bimbling (*Averrhoa Bilimbi*) have already perfected their fruits, and a great number of each kind have been already raised from the seed.

The Peenang or Betel-nut palm (*Areca Catechu*), together with the long and black peppers, have been raised from layers and seeds, but the true black pepper yet remains to be introduced into this island.

The Jambo iremava succeeds very well; this is the same plant as the Ayyah of Otaheite (*Eugenia malaccensis*).

There is one plant of the Caltaphas (*Terminalia Catappa*) in the Nursery at Bath which is near 12 feet high, and in the most luxuriant state of growth.

From this detail of the prosperous condition of the plants, there is every reason to expect complete success, and it will be extremely grateful to me to be directed by the Committee, to inform you of it within a short time ; in the meanwhile I am desired to offer whatever the island affords in the Botanical line that may be agreeable to you.

I have, &c.,

(Signed) HENRY SHIRLEY,
Chairman of the Committee.

Sir Joseph Banks, Bart.

The *Handbook of Jamaica* for 1901 (pp. 395–400) contains an interesting account of the history of the Botanic Institutions of the Colony (by Sir Daniel Morris), which has not been reprinted in subsequent editions. According to this :—

" A private garden possessing many rare and valuable plants had been formed by Mr. Hinton East in Liguanea (Gordon Town), which, on the death of the founder, became the property of his nephew, Mr. E. H. East, who with great generosity offered it to the Assembly of Jamaica for the use of the public at their own price."

It was accordingly purchased in 1792–3. A catalogue of the plants cultivated in it under the title of " Hortus Eastensis," is an appendix to Bryan Edwards's *History of the British West Indies.*

The garden was ultimately sold by the House of Assembly in 1810.

III.—THE 'NARA.

(*Acanthosicyos horrida*, Welw.)

The 'Nara is a remarkable plant, native of Namaqualand and Southern Angola. It belongs to the Melon family (*Cucurbitaceæ*), and was first described by the distinguished botanist and traveller Welwitsch in the *Trans. Linn. Soc.* (xxvii., 31).

Repeated attempts have been made to cultivate it at Kew, but without success.

Kew is indebted to Prof. MacOwan for the following interesting account of the habits and uses of this singular plant by Mr. John J. Cleverley, at the time Resident Magistrate at Walfisch Bay.

Resident Magistrate's Office, Walfisch Bay,
9th February 1891.

The 'Nara grows freely over the low sand hills covering the tract of country known as the " 'Nara Veldt," which consists of a waste of shifting sands lying between the ancient mouth of the Kuisip at Sandwich Harbour and the point where the river now disembogues at Walfisch Bay. The lower course of the river has gradually been pushed by the advancing sand-dunes from

Sandwich Harbour northwards to Walfisch Bay, but water can be found almost anywhere between the old and the new mouths by digging in the sand. Hence it would appear that the river water still travels seawards under the sands of its ancient bed. The sand of the district is composed of the disintegrated rocks of the neighbouring formation, consisting principally of granite, gneiss, mica-schist, and quartz. The clay deposits of the river contain much saline matter.

The 'Nara is popularly supposed to be independent of moisture, but I strongly doubt if this is really the case. The natives never attempt its cultivation or to aid in its propagation in any way. When the idea is suggested to them they simply laugh and say "The new 'Naras grow when the river comes down and there are plenty."

The Kuisip only runs at long intervals. It is now about seven years since it last "came down." Of course on the rare occasions when the stream flows into the sea along its present bed there is a great increase of underground drainage along the ancient waterways beneath the 'Nara veldt. I believe that after the river has been down the buried seeds of many past seasons begin to germinate and the new plants spring up in the sands of these river-beds after the water has disappeared from the surface. The blown sand then gradually forms round and covers the stem and runners which continually push upwards to the surface. A hillock or small dune is then formed, overspread with the bush, and so the process of growing and burying goes on till a considerable sand hill is formed crowned with the grey-green 'Nara —the stem of which now assuming the appearance of a root reaches far down to tap the water underlying the arid river-bed.

The fruit ripens about the end of January and lasts till May. For nearly half the year it forms almost the sole food of the Topnaars, while cattle, dogs, and jackals eat it readily. The seeds are sold to the local store-keepers and form an article of commerce under the name of "butter-pits." The taste of the fruit is by no means agreeable to the civilised palate, but the liking for it is sometimes acquired by the European residents who cannot easily obtain any other fruit.

It is said to possess great medicinal virtues and to be beneficial in cases of consumption. The natives undoubtedly thrive upon it, and those who go into the 'Nara veldt sickly and weak, come out at the end of the season strong and healthy looking. But these people live during the cold and foggy winter months on a not always sufficient diet of fish. The change to an abundance of fresh and satisfying fruit during the fine summer weather, in a healthy atmosphere, must of itself be an element in the beneficial result.

The curative properties of the fruit, *per se*, have yet to be tested. The root or buried stem is certainly used by the natives as a remedy for gonorrhœa, it is said with perfect success. "A decoction of the root, which is a strong purgative, is administered internally, and in severe cases an external application of the oil (?) extracted from the ripe fruit is made use of." (Mr. Wrey's Report of Survey.)

It has been stated that the 'Nara grows nowhere but near Walfisch Bay, but the natives say that it is to be found at intervals near the Coast, southward, in the direction of Angra Pequina, and northwards, towards the Cuanene River. As far, however, as I can gather, it would seem to flourish only near sandy river-beds where the roots can strike downwards to the underlying waters. If it were totally independent of this moisture there is nothing to prevent it spreading over the sand-dunes, but it does not do so.

In this district it does not grow to the northward of the Kuisip bed, although the sand-dunes extend to the River Swakop. I have seen a solitary stunted specimen growing near Rooikop, a granite kopje in the desert to the eastward, but it almost certainly sprang from seed carried by the black and white crows which nest there, and has no significance as regards the true habit of the plant. I have heard of a bush on the rocky banks of the Swakop, near Salem, but that also is a straggler and its presence is noted as a curiosity.

The views above expressed as to the dependence of the 'Nara on underground moisture may or may not be correct. They are borne out, however, by observation in this district, but more knowledge is required of the conditions under which this strange plant flourishes elsewhere, before a decided opinion can be arrived at.

(Signed) JOHN J. CLEVERLY,
Resident Magistrate.

IV.—POISON IVY.

The Poison Ivy of the United States is occasionally grown in this country, where its poisonous effects are little known and excite little alarm. Disagreeable effects are, however, apt to follow the use of its autumn-coloured leaves for table decoration. *Primula obconica* produces somewhat similar effects, and cases have occurred amongst the gardeners at Kew of serious irritation to the skin as the result of incautiously handling it.

The following article is reprinted from *Rhodora*, for March, 1902 (pp. 43-45) :—

IVY POISONING AND ITS TREATMENT.

Franz Pfaff, M.D., Ph.D.

Of all the cutaneous eruptions caused by poisoning plants those produced by poison ivy (*Rhus Toxicodendron*), and by poison sumach (*R. venenata*), are probably the most common in this country.

It is the general belief of the public and of most physicians that the eczematous conditions, which occur in many persons after handling such plants, may be caused also by emanations from the plant, the active principle being thought to be a volatile substance.

The two attempts to isolate the active principles failed. One of the investigators, J. Khittel, attributed the action of poison ivy to

a volatile alkaloid, the other, John M. Maisch, denied it, stating that volatile acid, which he called "toxicodendric acid," is the active principle.

Both statements proved to be erroneous, as experiments which I made a few years ago have shown.

The lack of any rational treatment of ivy poisoning may be ascribed to the imperfect knowledge of the cause of this disease.

In my researches (*Journal of Exper. Med.*, Vol. II., No. ii., p. 97) I used different parts of the plants, gathered at different seasons of the year, and found that the so-called "toxicodendric acid," which Maisch did not produce in the chemically pure state, is nothing but acetic acid, and, therefore, not the cause of the eruption peculiar to ivy poisoning.

Further investigations showed that the active principle is an oil, which I named "Toxicodendrol," and which can be found in all parts of the plants, both in *Rhus Toxicodendron* and *Rhus venenata*. This oil is easily soluble in alcohol, ether, chloroform, &c., but is insoluble in water. Toxicodendrol is easily decomposed by heat, but very slowly at ordinary temperatures. A sample of it, which had been kept in an open porcelain dish for over 13 months, was partly converted into resin, but the remaining oil proved to be just as active as before. The active oil was also prepared from plants collected during the winter, after having been covered with snow for weeks, and from dry stems and branches which had been kept in the laboratory for over a year.

To test the strength of the "Toxicodendrol," I made many experiments and found the oil active in the minutest quantities; in one case as little as $\frac{1}{1000}$ mg. of the oil dissolved in 2 drops of olive oil proved effective.

The time of incubation varied from 18 hours to 9 days. This long period of incubation and the stability of the oil explain the belief that direct contact is not necessary to contract the disease. When the first symptoms appear, several days have usually passed, and a person may then not remember having come in contact with the plant. On the other hand, some of the oil may stick to the clothing, &c., and this may cause the disease even after several months have passed. In making these experiments, I handled more than 25 kg. of the plants, and several hundred persons passed through the laboratory, where these experiments were made, but not one of those who did not come in direct contact with the plants or the free oil was poisoned.

It seems possible that poisoning might be caused by small particles of the plant, such as pollen and the hairs from the leaves, being carried through space by the wind and thus brought in contact with the skin or clothing, for, as above stated, the oil is contained in all parts of the plant, and even the hairs of the leaves may be seen under the microscope to contain oil.

Having defined the properties of "Toxicodendrol" we may now outline the rational treatment of ivy poisoning. As we have said, "Toxicodendrol" is not a volatile oil, but, on the contrary, is very stable; we must endeavour to remove it as quickly as possible and prevent its spreading.

This can be done by vigorously washing the affected and exposed parts with soap and water and a scrubbing brush ; that is to say, by mechanically removing the oil. As the active principle is very soluble in alcohol, other processes may be employed to remove the oil. The exposed parts may be washed repeatedly with fresh quantities of alcohol and a scrubbing brush. The poisonous oil may be thus removed in alcoholic solution. Another way of proceeding would be to wash the exposed parts with an alcoholic solution of lead acetate ; in this case the poisonous principle would be first transformed in its insoluble lead compound and then washed away with alcohol.

The washing must be done thoroughly when alcohol is employed, as otherwise the alcohol might only serve to distribute the oil more widely over the skin. The finger nails should be cut short and also perfectly cleaned with the scrubbing brush. Oily preparations, or anything which dissolves the poisonous oil, if used, should be immediately removed, as they may only spread the poison, giving it a larger area on which to work.

The treatment above outlined cannot cure the already inflamed parts, which must heal by the usual process of repair, but it does prevent the spreading of the inflammation, and may serve to remove the poison before it has had time to produce its characteristic effects upon the skin.

Harvard Medical School, Boston.

V.—STAPELIAS.

The *Asclepiadeæ* are remarkable amongst Dicotyledons for having, like the *Orchideæ* amongst Monocotyledons, their pollen coherent into waxy masses called *pollinia*. There is no other resemblance between the two families, and the complicated modes of fertilization to which their peculiarity of structure lends itself are essentially different in the two cases. Amongst the *Asclepiadeæ* no tribe is marked out by such striking characters as the *Stapelieæ*. They were amongst the earliest South African plants to attract the attention of cultivators in Europe. Francis Masson, " then one of the under-gardeners at Kew," who was sent out in 1792 to collect plants for the establishment, paid particular attention to them, and in 1796 published a folio volume of coloured figures and description of species of the group which is now rare.

Stapelias are by no means easy to keep alive under horticultural conditions.

The following memorandum drawn up by Mrs. Barber, a well-known African botanist and an accomplished artist, gives some account of their habits in their native country : —

In this colony the name Stapelia is given indiscriminately to all the different species included in the genera *Piaranthus*, *Huernia*, and *Stapelia*. They are all commonly known as " Stapelias " throughout the land.

These remarkable plants, are wonderfully adapted to thrive in the uncertain climate of South Africa. It will nevertheless be found that their habits and peculiarities render them at all times somewhat uncommon and rare. A stranger unaccustomed to seek out their hidden abodes might traverse the whole country without seeing a single specimen, and yet they are so well dispersed that no locality is without especial varieties. They lie hidden in remote nooks and corners, in which they may so easily be overlooked, even when you know them well, that you find them where you are not expecting; you come upon them as it were unawares, beneath some shady bush or perchance clinging to the face of a rugged precipice, or behind some projecting rock. Some species prefer shade, while others delight in the full blaze of an African sun. They are exceedingly tenacious of life, surviving long seasons of protracted drought, and even when their roots have entirely failed, some of the succulent branches that have fallen to the earth strike root afresh, and rise as it were from the ashes of the original plant.

Stapelias are true evolutionists, they do not grow where they would choose to grow, nor where they would thrive the best, but where they are enabled to hold their own against an all-powerful and overwhelming host of grasses, and other irrepressible plants, in some secluded spot, frequently where a shelving rock will lend a helping hand against invasion. Nevertheless I am sorry to state that these interesting plants are rapidly disappearing from all parts of South Africa. Civilization and colonization are both dead against them. They are eaten up by "all kinds and conditions" of cattle. For instance, if an ostrich finds a Stapelia plant he seldom leaves without taking nearly the whole of it with him. Cattle, sheep, and goats, in like manner feed upon them greedily. The native tribes during years of severe drought and famine use these plants as food, and native children delight in their sweet young succulent branches. The florist and the gardener go hand in hand with the rest in this work of destruction, for you will hear them exclaiming "Oh! here is one of those curious Stapelias," and it will speedily be pulled up and planted in some flower-bed, where for want of care it will be overgrown by other plants and lost.

The great bulk of Stapelia-species blossom in the autumn season; occasionally some of the small kinds flower in spring after the rains have fallen, and continue in blossom during the whole of the summer, when rarely flowers and seed pods may be found upon the same plant, but not upon the same branches.

As a rule Stapelias do not seed freely; a great proportion of the flowers remain unfertilized. When fertilization has taken place the large blossom speedily falls, while the stem with the ovary grows thick and large, and turns down where it becomes hidden among the succulent branches, remaining in this position during the whole of the ensuing winter, being thus secure from all harm, not rising again until after the rains have fallen in spring, at which time it will be observed mounting up in a perpendicular manner from its lowly bed, and standing out above the plant, when the pods will be rapidly developed like great horns. They then remain stationary until they become ripe, when the pods open

and the winged seeds are carried off by the first high wind that blows, and removed far from the locality and the lowly plant from whence they sprang, and the world is all before them.

In some of my paintings the large seed pods might be supposed to be growing on the same plant as the flower. I have placed them in this position to show the manner in which they usually appear in nature. However, the paintings mostly consist of two or more plants, together with their whole belongings, roots, branches, flowers, seeds, etc., etc.

The paintings are in all cases measured; they are exactly the life size of the plants. In the painting of *Stapelia grandiflora* the leaves are not shorter than they often appear, although in many cases when they are amongst bushes, they are drawn out to a much longer length than they are in my painting of the flower.

M. E. Barber.

VI.—RAHAT LOUKOUM.

Rahat Loukoum is the Turkish name of a sweetmeat much consumed in Greece and occasionally offered for sale in Western Europe. According to a report by Mr. W. H. Cottrell [F. O. Reports, Annual, No. 1362, p. 14] :—"the primitive article" was "flavoured with otto of roses and Chio mastic. The latter drug, which is the product of *Pistacia Lentiscus*, was held in the greatest esteem in the Middle Ages and down to the 17th century, Chio being long regarded as the only region in the world capable of affording it. It is still used in the East as a masticatory, and it would appear possible that out of this use 'Rahat loukoum' developed."

This seems more than probable. Masticatories of some kind or other are used by all races. They increase the flow of saliva which supplies the ferment which converts the starch of food into digestible sugar, and thus aids digestion. This, however, does not wholly account for their use, which is often excessive. Mastic was perhaps one of the most primitive. The sweetmeat was probably at first only its vehicle. Now it has practically superseded it, and mastic only remains as a flavouring ingredient.

The following account is extracted from the *Journal of the Society of Arts* for July 27, 1894, p. 756 :—

"The *Revue d'Orient* says that of all the various descriptions of confectionery prepared in Turkey, that known by the name of *locoum* enjoys the highest reputation. This sweetmeat is manufactured at Constantinople, Smyrna, and Syra, and is exported in very large quantities, principally to Marseilles. There are different kinds of locoum, according as to whether for flavouring purposes essence of roses, pistachio, or almonds enter into its composition. In Turkish, locoum is called *rahat locoum*. It might be supposed, in seeing the warm and transparent colour of this sweetmeat, that a variety of elements enter into its composition, and that it is a difficult thing to make, but, as a matter of fact, only two ingredients are used, sugar and starch, and its preparation is very

simple. As regards its manipulation, great care and attention must be devoted to it, and in this lies the whole secret of its manufacture, which has never yet been successfully accomplished in Europe, although very frequently attempted. The first operation is to melt some starch in cold water; this starch is then placed in a large pan with a certain quantity of sugar, and the pan is placed on a fire for about two hours, two men taking it in turn to stir the mixture. The sugar must be stirred without intermission, and always in the same way, otherwise the paste will not become uniform; any mistake in this manipulation resulting in the crystallisation of the sugar. When the paste is well formed, it is poured out into little wooden moulds, these moulds being first of all sprinkled with finely-powdered sugar, to prevent the sweetmeat adhering to them. The contents of the moulds are then poured out on to marble slabs, and, by the aid of a peculiarly shaped knife, the locoum is cut into strips about three centimetres wide, and these strips are again cut into small cubical pieces. It has been stated above that pistachio and almonds are used in the preparation of locoum, and to these must be added mastic, but these articles are only introduced when the cooking of the mass is completed; they are then in certain proportions added to the paste, which is well stirred. In the case of the mastic, this, reduced to a very fine powder, is thrown into the pan at the very last moment. It may here be observed that mastic is very largely used and in many different ways in the East. There it is used by women, who chew it, with the object of imparting fragrance to the breath and a good colour to the teeth. The men mix it with alcohol during distillation, and a cheap liqueur is obtained, which is largely consumed. The best mastic comes from Chio."

Some enquiry having been made, the following report was obtained through the good offices of the Foreign Office :—

British Consulate,
Syra, November 4, 1893.

My Lord,

With reference to the manufacture of Syra "Rahat Loukoum" (Turkish Delight) mentioned in Sir Villiers Lister's Commercial Despatch No. 1, of the 20th ultimo, I have the honour to submit the following remarks as desired by the Director of the Royal Gardens at Kew.

The decline of this once flourishing industry is to be attributed on the one hand to the depreciation of the forced currency, which has steadily increased for the last three or four years, attaining the present ruinous proportion, and on the other to the heavy Custom dues levied on nearly every article of import.

As a matter of fact, the price of sugar, the chief ingredient in the manufacture of this sweetmeat, is now unprecedentedly high, the Custom duty on the same being 1·10 drachmas per oke (2·8 lbs.), which exceeds the value of the article itself.

The price of starch and the flavouring essences have also increased considerably in proportion, the Custom dues on the same being at present 20 leptas and 5 drachmas per oke respectively.

Vanilla, a favourite flavouring essence, is exceptionally dear, paying 20 drachmas per oke Custom duty alone. Vanilla is brought from Germany in dried pods.

Mastic, another flavouring material, is brought from Chio in semi-transparent resinous tears, exuding from the mastic tree grown on that island, and also obtained by incision.

Pistachio is either brought in nuts from Syria, or in a liquid state yielded from the kernel.

Chocolate is brought in cakes from France and Germany, whilst the other flavouring essences, viz. :—banana, rose, violet, citron, mandarine, mint, pine, almond, orange, lemon, &c., are brought in liquids from Germany.

An inferior quality of citron is produced locally from the rind of the Naxos citron.

The confection has up to the present been generally consumed throughout Greece, and the manufacturers are unable to increase the prices, as the Greeks will not pay more than they have been accustomed to do for so many years.

Several attempts have, however, been made to introduce the article in England, but it has been found impossible to compete with the Smyrna produce, which is by far inferior in quality, on account of its cheapness.

This obstacle will, it is hoped, be removed by the coming in force of a Bill already passed in the Greek Chamber of Deputies, in virtue of which the Syra manufacturers will be given the option of drawing from the Custom House, free of duty, a stated quantity of sugar under guarantee that it will be returned in the shape of "Rahat Loukoum" for exportation.

The Bill has not come in force yet through some unknown delay on the part of the Government, but the Syra merchants hope the matter will be taken in hand as soon as a change of Ministry takes place, which is generally anticipated.

As stated in our Trade Report for last year, the excellence of this confection is chiefly attributed to the water of the island, and the circumstance, illustrative of this statement, may be mentioned, of some of the Syra manufacturers having attempted to establish factories at Trieste, Smyrna and New York, but failed to produce the excellent article made here, owing apparently to the employment of a different kind of water.

"Rahat Loukoum," as the words imply, is essentially of Turkish origin, the primitive article having been flavoured with otto of roses or Chio mastic.

The industry was introduced into Syra from that island, over half a century ago, by a certain Otamatelaki, one of the numerous fugitives from the massacre of Chio in 1822, who found refuge and established themselves in the Cyclades. His children, who succeeded him in the trade, have gradually perfected the article, stripping it of its Eastern peculiarity and making it more suitable to European taste, for which they have been awarded prizes on different occasions.

Although other factories not connected with the above have also been at work for many years, the firm which originally introduced the industry still enjoys the primacy.

Another innovation introduced by the same firm is *candied* "Rahat Loukoum," a quantity of it having been prepared expressly for the Chicago Exhibition, but owing again to some unfortunate delay on the part of the officials appointed for the purpose, the article was not sent in time, thus depriving the manufacturers of another well-merited prize.

I have the honour to be,
My Lord,
With the greatest respect,
Your Lordship's most obedient, humble servant,

W. H. COTTRELL,
Consul.

The Right Honourable,
The Earl of Rosebery, K.G.,
Her Majesty's Principal Secretary
of State for Foreign Affairs.

VII.—PLANTING BOG LAND.

The Congested Districts Board for Ireland made an experiment, which does not appear to have been attended with much success, to plant bog land at Knockboy, in the West of Ireland. Professor Schlich, F.R.S., was invited in 1895 to inspect and report on the result.

In order to prepare himself for the work, Professor Schlich, with characteristic thoroughness, "visited a number of places situated in the North of Germany, between Bremen, Hamburg, and Cuxhaven on the North Sea."

The result of Professor Schlich's observations was given in a departmental report which for some years was regarded as "confidential." They are, however, so valuable as to deserve the wider circulation which it is hoped will now be given to them :—

"The soil throughout the Knockboy estate may be described as more or less boggy, except small portions on the hill where the rock appears on the surface. The depth of bog varies from a few inches to over ten feet. So far, it has not been possible to observe any decided difference in the progress of the young trees on shallow and on deep bog. The oldest plantation is, however, only four years old, and this particular area is exposed to other very unfavourable conditions. Of the older plantations which I saw in County Galway, none are situated on deep bog land, so that they do not teach us in how far success on deep bog may be looked for. Under these circumstances I had to look elsewhere for evidence, and this I found in a number of bogs situated in the vicinity of Bremen and Hamburg. There I visited more particularly the reclamation works which have been carried out in the bogs of Hellweger, Augustendorf, and Burgsittensen.

Hellweger Bog.

This bog has a depth of up to 25 feet. On parts where the peat had been cut, and the upper layer only unfit for fuel, left on the mineral soil, I found very flourishing woods of Oak, Spruce, and Scotch Pine. On the uncut bog of an original depth of 24 feet, where draining operations were commenced nearly 100 years ago, and in the vicinity of a settlement, I found very fine Spruce and Oak woods. Both were about 42 years old, and the trees showed the following average dimensions :—

Spruce.—Height 54 feet, diameter = 12 inches, measured at 4 feet from the ground. The trees were straight and in every way well grown.

Oak.—Height 45 feet, diameter = 16 inches, measured at 4 feet from the ground, with clean boles up to 23 feet long.

I also found Apple trees close by laden with fruit.

All these trees were in the immediate neighbourhood of the settlement, on an area which had been drained for a considerable number of years before the trees were planted. Cattle, pigs, geese, and fowls, were constantly straying into these woods, so that the soil had the benefit of their droppings.

Here then is an instance which shows that good trees can be grown on bog land which has been drained for some time, and which has to some extent been manured.

Augustendorfer Bog.

Of this bog an area of about 2,800 acres has been planted up with forest trees.

The depth of the bog ranges from 20 to 26 feet, and its composition resembled in every way the deeper bogs found in County Galway. The surface is covered with heather, with here and there a little grass. Under the heather lies a thin layer of humus produced by the heather, then comes a layer of light yellowish brown peat (used for the manufacture of litter), and this goes gradually over into a darker mass, which is cut and used as fuel.

The process of cultivation was as follows :—

The area was drained, so that the ditches divided it in strips 30 feet broad. The ditches on each side of the strips were 2 feet deep, while the main ditches were of sufficient depth to carry off the water. During six years the surface layer of the soil was lightly burned, and buck wheat grown. After the harvesting of the sixth crop, the ditches were deepened to 3 feet, and each strip was divided into two 15-feet broad strips by an additional ditch. The soil taken out of the ditches was spread over the intervening areas. Then forest trees were planted, especially Oak, Spruce, Scotch Pine ; and later on also, Larch, Weymouth Pine, and Austrian Pine, while Birch appeared in large numbers from seed brought by the wind.

The first forest plantation was made in 1868, so that it is now twenty-seven years old ; the youngest is eight years old.

These plantations did at first very well, so that very promising results were expected. At the age of ten to twelve years, however, the trees began to fall off, and now it is clear that the whole must be put down as a failure. The Oaks have mostly disappeared, and those which still exist are miserable specimens of the species. The Spruce also has done very badly. The Scotch Pine suffers dreadfully from the leaf-shedding disease, and from the attacks of an insect (*Retinia buoliana*); in a few places it has done better, where the bog is less deep, but even here it is very branchy. Larch looked miserable in most parts, and only fairly well in a few. Austrian Pine, of which only a few specimens existed, had done fairly well, but it had a very bushy appearance. Weymouth Pine had, up to an age of fifteen years, done better than any of the above-mentioned pines. Best of all had, no doubt, done Birch. That tree was at first cut away, because it threatened to interfere with the other species; now it is being sown in strips, to replace them, where they have failed.

The result of my inspection of the Augustendorfer bog is, that profitable forestry without artificial manuring is not practicable on deep bogs.

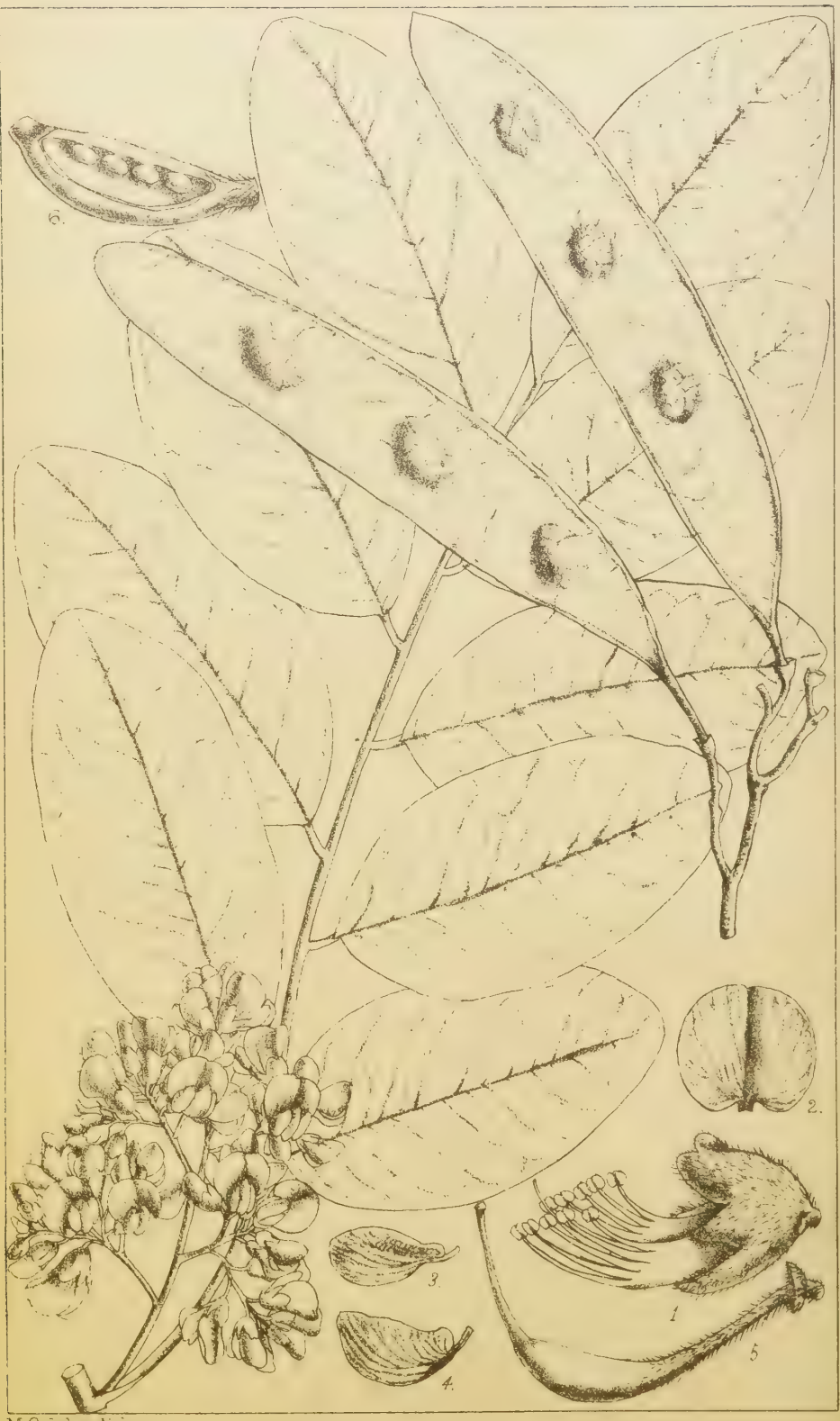
Burgsittensen Bog.

I next visited this bog, where I was told plantations have been established on varying depths of bog-land. Here the land had been drained by ditches fifteen feet apart, and the species grown were the same as on the Augustendorfer bog. The depth of bog ran from perhaps eighteen inches to several feet. I went carefully through the plantations which run up to an age of about thirty years, and I came to the conclusion that success depends in the first place on the depth of the bog. Wherever it was not more than about three feet, the plantations did well; as soon as the depths increased beyond a yard, the growth of the trees fell off at once. Places with a depth of four-and-a-half or five feet could be picked out at a glance by the inferior development of the trees. This I consider a very important lesson, which I learned on this tour.

As regards species, Burgsittensen showed that *splendid* Oak can be produced on bog not more than two feet deep, and fair Oak up to three feet deep, but not beyond. Weymouth Pine here also had done particularly well; Scotch Pine came next, and then Spruce. Of Larch, not much was seen here.

The conclusion to be derived from the above notes may be thus worded:—

On old-drained and manured bog-lands profitable forestry can be carried on, irrespective of their depth; on newly drained bog-lands profitable forestry ceases with a depth of bog of about three feet, unless such land is manured or improved by bringing mineral soil on to it.



M.S del. et lith.

Dalbergia hupeana, Hance.

VIII.—PAI-T'AN TREE.

(*Dalbergia hupeana*, Hance.)

(With Plate.)

This is a tree of moderate size, rarely attaining 50 feet in height, which is common in the central provinces of China, being recorded from Szechwan, Hupeh, Kiangsu, and Chekiang. It is essentially a tree of the plains and low hills, and is never met with in the mountain forests. It is now usually seen planted along road-sides and around villages.

Its wood is hard and durable and is used for purposes where strength and elasticity are required, as in the making of rammers for oil-presses, tool handles, wheel-spokes, and blocks and pulleys. A pulley made of this wood, sent by me from Ichang, is now in the Museum at Kew, where there are also specimens of the timber forwarded from Ningpo by Consul Cooper.

The tree is known in Hupeh as the *t'an* tree, and at Ningpo as the *pai-t'an*. The t'an tree has been familiar to the Chinese from the earliest times,[1] and is frequently mentioned in their classical writings. Chariots made of its wood were employed in the famous battle of *Mu-Ye*, which occurred in B.C. 1122. Another early allusion refers to its use in making the naves of wheels. It is figured in the illustrated Chinese Botany, the *Chih Wu-Ming*, xxxv. 24; and the author of the great Chinese Herbal, the *Pên-Ts'ao Kang Mu*, describes it as a tree with a finely-veined hard wood and with leaves resembling those of *Sophora japonica*. European translators of the Chinese Classics have erroneously identified this tree with Sandalwood, which is called *T'an-ksiang*, and has always been an import into China.

The plate is reproduced from *Hooker's Icones Plantarum* (t. 1968), which may be referred to for botanical details.

AUGUSTINE HENRY.

IX.—POTTERY TREES.

Nothing is, perhaps, more remarkable than the empirical knowledge possessed by uncivilised peoples of the properties, useful or otherwise, of the vegetation amongst which they live.

One of the most curious is the use by the Brazilian aborigines of the ashes of the bark of a tree in the manufacture of a rude pottery. This was first pointed out by Aublet, and is the subject of a note by the well-known traveller, the late R. Spruce, A.L.S., whose acute observation nothing escaped, in the *Kew Journal of Botany*, 1850, p. 73.

Apparently the alluvial clay used in making the native pottery is incapable without additional silica of producing a body of sufficient hardness when fired for practical purposes. But ordinary sources of silica are not available. The bark of the Pottery tree appears to yield what is wanted.

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(1) *See* Bretschneider, *Botanicon Sinicum*, ii. 375. (*Shanghai*, 1892.)

The Kew Museums contain a fine series of specimens illustrating the practice, collected by Spruce. There was some uncertainty as to the precise species employed in their case, and an enquiry received the following interesting reply :—

Coneysthorpe, Malton, Yorkshire,
13th June 1880.

Dear Sir,

The piece of pottery about which you ask, from its size and colours, was probably made on the River Naupés, where I saw Caraipé ware in the greatest abundance and perfection. I have somewhere a list of all the articles I sent to Kew, but it is many years since I saw it last, and it has been so carefully stowed away that now when I want it to refer to it I cannot find it.

If the vessel be really from the Naupés, there is little doubt that the flinty bark mixed with the clay to render it fireproof was not derived from what you call "*Moquilea utilis*," but from one or more of at least half-a-dozen different Chrysobalans, all of which I have seen used for that purpose on the Naupés. Even at Pará, I should much doubt that Caráipé (as it is called) was the product of only a single species ; but my stay there was too short to ascertain the fact. Since the days when I was a botanist the species of *Chrysobalaneæ* have been banded about among sundry genera, but all the trees of which I gathered specimens, and whose bark I saw used in making pottery, were referred by Mr. Bentham to *Licania* ; there was not a single large-flowered species among them—no *Parinarium*, no *Couepia*, &c. If I recollect rightly, the tree which afforded the best Caraipé on the Naupés was one I sent specimens of under the name of *Licania crassivenia*.

* * * * *

Faithfully yours,
Richard Spruce.

The late Dr. Flight, F.R.S., very kindly determined the silica in the ash of the bark. It proved to consist of something less than a quarter of its weight.

2nd June, 1880.

The bark was pounded in a mortar, which is easily done, and dried in each case at 110° C. during several hours. Three portions were examined :—

No. 1. The entire bark.
„ 2. The outside (very thin layer).
„ 3. The inside („ „).

And the ash (burned quite white) amounted in each case to :—

No. 1. 21·92 per cent. of bark.
„ 2. 18·19 „ „
„ 3. 23·02 „ „

I enclose No. 2. You might like to see it under the microscope. I analysed No. 1 in a way. I drove off the silicic acid with ammonium fluoride and after converting the fluorides of the residue into sulphates weighed them : they amounted to 1·33 per

cent. It appeared to consist entirely of lime and potash sulphate. Phosphoric acid, magnesia, lithia, &c., were absent. Assuming the lime sulphate and potash sulphate to be present in equal equivalent proportions, which appeared to be the case, the above amount of sulphate corresponds to about 0·66 per cent. of bases which being deducted (in the case of No. 1., the ash analyzed) leaves 21·26 per cent. of silica. The mixed sulphates when heated were decidedly green in colour, but became white when cold. I tried this over several times.

X.—VEGETABLE RENNETS.

The *Kew Report* for 1881 (pp. 36–37) contained some account of *Withania coagulans*, a well-known North-West Indian plant which possesses the power of coagulating milk. The interest of the subject arose from the fact that if cheese was to be made in India the religious prejudices of the Hindoos would not allow the rennet of the calf to be used for the purpose.

The "Rennet Ferment" contained in the seeds was investigated by Mr. Sheridan Lea. (*Proc. Roy. Soc.* Vol. XXXVI., pp. 55–58.)

Meanwhile Mr. W. R. Robertson, Agricultural Reporter to the Government of Madras, in his Annual Report for 1882–3 (pp. 74, 75) gave an interesting account of some experiments on other Indian plants with similar properties.

As this is practically inaccessible it is reproduced here.

"Attention having been directed to the properties of the berries of *Withania coagulans* for curdling milk in cheese-making, it was thought desirable to try the properties of a nearly allied plant *Withania somnifera*, a well-known plant in South India, where *Withania coagulans* is unknown.

"The curd on being sufficiently formed was broken up and the whey separated as far as this was possible ; the broken curd after a little salt had been added was put into a roughly made cheese press.

"In one set of experiments twenty-one ollocks of milk were taken and kept aside until the milk was faintly acid to test-paper. The milk was then gently heated to 110° F. and divided into seven portions of three ollocks each. To the first were added twelve drops of churn milk, to the second twelve drops of lime-juice, to the third twelve drops of tamarind-juice of the consistency of the milk itself, to the fourth about a teaspoonful of the extract of the *Withania* berries, to the fifth twelve drops of the juice of the bilimbi fruit (*Averrhoa Bilimbi*), to the sixth the raw juice of twelve *Withania* berries, and to the seventh about one drop of the milky juice of *Epicarpurus orientalis* (Prayam or Cootty pela). All these agents were tested with blue litmus paper, and they had a distinctly acid reaction. In three hours, the milk treated with the milky juice of the Prayam plant was found to have changed into a very firm cylindrical block of curd with a layer of clear supernatant whey. There is not a doubt but that this is quite equal to rennet ; it does not in the least affect

the flavor of the cheese, nor does it require any preliminary preparation; it is procurable at all times, and the plant is very common. When the curd produced by this coagulant was put into a dish, it at once formed a circular disc without the least disintegration. The curd was then cut up with a clean bamboo spatula, the greater part of the whey drained off, and the curds were then evenly mixed up with finely-powdered salt at the rate of $3\frac{1}{4}$ ounce to 1 gallon of the curds, and put under the press. The quantity of cheese thus obtained from three ollocks of milk was $2\frac{3}{8}$ ounces, or about $6\frac{1}{3}$ ounces per Madras measure of milk. The quantity of the salt added was found to have been excessive; probably half the quantity would have been quite sufficient. The milk treated with the churn-milk took five hours to curdle, and the curds were not firm; and the curds in the other experiments were even more inferior. It appears that the firmness of the curds depends, not on the strength of acidity in the curdling agent, but on the strength of some fermentative principle in it. The extract of the *Withania* berries was prepared by simmering half an ounce of the berries in one ollock of water for about four hours on slow fire.

"It has been found that the best results are obtained with Prayam leaves when using 16 leaves to one measure of milk. The great drawback to the use of this curdling agent is the necessity of taking the milk to be curdled to the tree, as the minute globules of juice, at the fracture where the leaf is broken from the branches, drop off in removing the leaves to the dairy. These experiments will be continued. It may be possible to collect from the leaves of Prayam bush the coagulating agent and to store it for future use."

XI.—MISCELLANEOUS NOTES.

Visitors during 1902.—The number of persons who visited the Royal Botanic Gardens during the year 1902 was 1,323,376; that for 1901 was 1,460,169. The average for 1892–1901 was 1,355,503. The total number on Sundays was 562,611, and on week-days 760,765. The maximum number on any one day was 63,257 on March 31, and the smallest 85 on February 3.

The detailed monthly returns are given below:—

January	20,872
February	19,502
March	156,409
April	95,408
May	157,068
June	210,499
July	172,959
August	212,154
September	162,467
October	63,524
November	32,947
December	19,567

HERMANN WENDLAND.—Hermann Wendland, the distinguished Director of the famous Royal Gardens at Herrenhausen, who died on January 12, 1903, after a long illness, stands out conspicuously as one who has accomplished much in the fields of both botany and horticulture.

He was born in October, 1823, in Herrenhausen, where his father and grandfather preceded him as Director of the Gardens, and where he received his early training. He afterwards worked for a time in the Botanic Gardens at Göttingen and in the Imperial Gardens at Schönbrunn, proceeding thence to Kew. Here he was employed for nearly two years as a gardener, leaving in 1849 to return to Herrenhausen as assistant to his father, whom he succeeded as Director on the latter's death in 1870. In 1857 he was sent on a botanical expedition to Guatemala and Central America, where he collected many new and interesting plants, several of which he introduced to cultivation. Amongst these, perhaps the most notable was *Anthurium scherzerianum*, which he found in Costa Rica.

He prepared and published in 1854 a list of the palms cultivated in European collections. This was followed by researches amongst the species of this difficult order with so much zeal and activity that he soon became the recognised authority with regard to them. In their cultivation he was no less enthusiastic and successful, and the collection of palms at Herrenhausen probably rivals even that of Kew.

Mr. GEORGE S. JENMAN, F.L.S., was born in the south of England in 1845. After a period of training at Kew he was appointed, in 1873, Superintendent of the Castleton Garden, Jamaica. Six years later he became Government Botanist and Superintendent of the Botanic Garden, Georgetown, British Guiana, a post he held until his death on February 28, 1903. While in this position he was largely occupied in developing the economic resources of the colony. In this direction mention must be made of the important series of experiments with seedling sugar-canes which he carried out, at first on his own initiative and later in association with Professor Harrison, the Government Chemist. His principal botanical work was amongst the Ferns of the West Indies, to which he had long devoted special attention. In addition to numerous descriptions of new species published in various journals, he published in 1881 a *Hand-list of Jamaica Ferns*; and in 1898 commenced in the *Bulletin* of the Royal Botanic Gardens, Trinidad, an enumeration, with descriptions, of the Ferns of the British West Indies and Guiana, a work for which he was eminently qualified, but which unfortunately he was destined not to carry to completion.

Mr. J. F. DUTHIE, B.A., F.L.S., having retired from the position of Director of the Botanical Department of Northern India, has been appointed Assistant for India on the staff of the Royal Botanic Gardens by the Secretary of State for India in Council.

Mr. S. F. D. HARWOOD, B.A., of St. John's College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Professor of Chemistry in the Royal College, Mauritius. Before leaving for Mauritius, Mr. Harwood spent a short time at Kew for the purpose of acquainting himself with the experimental work which has been done in Barbados and British Guiana in connection with sugar cultivation.

Mr. L. LEWTON-BRAIN, B.A., of St. John's College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Mycologist and Lecturer in Agriculture to the Imperial Department of Agriculture for the West Indies.

Mr. STEPHEN TROYTE DUNN, B.A., F.L.S., Assistant for India in the Herbarium of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent of the Botanic and Afforestation Department, Hong Kong.

Mr. HENRY HAROLD WELCH PEARSON, M.A., F.L.S., an Assistant in the Royal Botanic Gardens, has been appointed by the South African College Council, on the recommendation of Kew, Professor of Botany in the South African College, Cape Town.

Mr. FREDERICK SAMPSON SILLITOE, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed by the Governor of Khartoum Province, on the recommendation of Kew, Head Gardener of the Palace Gardens at Khartoum.

Mr. DAVID TANNOCK, formerly a member of the Gardening Staff of the Royal Botanic Gardens, and late Officer-in-Charge of the Agricultural School, Dominica, has been appointed Superintendent of the Botanic Garden, Dunedin, New Zealand.

Mr. ARCHIBALD BROOKS, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Officer-in-Charge of the Agricultural School, Dominica, in succession to Mr. D. Tannock.

Mr. W. R. ELLIOTT, formerly a member of the Gardening Staff of the Royal Botanic Gardens, and for some years Curator of the Botanic Garden at Grenada, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Forestry Officer in Northern Nigeria.

Mr. FRANK EVANS, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent of the Royal Botanic Gardens, Trinidad.

Mr. WILLIAM DON, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, an Assistant Curator of Botanic Stations on the Gold Coast, to take charge of a newly-established branch station at Tarkwa, in the western district of the colony.

Mr. WALTER FOX, formerly a member of the Gardening Staff of the Royal Botanic Gardens, and late Assistant Superintendent of the Botanic Gardens, Singapore, has been appointed by the Secretary of State for the Colonies, Superintendent of Garden and Forests, Penang, in succession to Mr. C. Curtis, retired.

Mr. ROBERT DERRY, formerly a member of the Gardening Staff of the Royal Botanic Gardens, and successively Assistant Superintendent of the Botanic Gardens, Malacca, and Superintendent of the Government Gardens and Plantations, Perak, has been appointed Assistant Superintendent of the Botanic Gardens, Singapore, in succession to Mr. Fox.

Mr. HENRY POWELL, formerly a member of the Gardening Staff of the Royal Botanic Gardens, and late Curator of the Botanic Station, St. Vincent, has been appointed by the Secretary of State for Foreign Affairs, Assistant in charge of the Tropical branch of the Department of Agriculture of the East Africa Protectorate.

Mr. ERNEST BROWN, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for Foreign Affairs, Assistant in the Scientific Department of the Uganda Protectorate.

Dr. Alexander Prior's Herbarium and Botanical Library.—Dr. Richard Chandler Alexander Prior died on December 8th, 1902, in his ninety-fourth year. He bequeathed the whole of his herbarium to Kew, together with a sum of money to defray the cost of removing the same from his residence at Halse, near Taunton, to Kew, where it was delivered April 15th, 1903. Dr. Prior travelled and collected plants on a large scale in the South of Europe, South Africa, Canada and the West Indies, and distributed duplicates during his lifetime. His *Herbarium proprium* is estimated to contain about 30,000 sheets, of which some 7,000 are South African, and 4,500 West Indian, mainly from the Blue Mountains, Jamaica. These two collections form the most valuable part, and were all collected by himself.

Dr. Prior had also a considerable Botanical Library, a selection from which, of about 140 volumes, was presented to Kew, by his heir, Sir Prior Goldney, Bart. They are classical works of which Kew greatly needed second copies for the use of the ever-increasing number of workers here.

W. B. H.

Anabasis Haussknechtii, *Boiss.*—The twigs of this plant are sold in the bazaars of Ispahan, where I myself have bought a sample of them. They were called "sodab," a name which, however, is usually applied to specimens of *Haplophyllum*, and were said to be used for washing. Mr. Th. Strauss, in Sultanabad, sent me some time ago a small sample of the same material by the name of "galiab," together with a specimen of the plant from which it is derived. He then said that it is used in the dyeing manufactory. On my request to give more particulars about the use of the plant he informed me that the dyers use it for washing wool, and that it makes with boiling water a sort of lather. At the same time he sent a large sample of what he meant to be the same drug. It contained, indeed, twigs of *Anabasis Haussknechtii*, but I convinced myself from the sample now in our museum that it consists *chiefly* of the twigs and leaves of *Seidlitzia florida*, M.B., another Salsolacea. *Anabasis Haussknechtii*, Boiss., was found by Dr. Haussknecht and myself near Ispahan, where it grows in abundance over large areas of gravelly and somewhat salty soil. It is frequent, according to Mr. Th. Strauss, in the salty plain near Sultanabad, and there is also a specimen in the Herbarium from Chehar Mehall in Persia, collected by Dr. Haussknecht. *A. Haussknechtii* is closely allied to *A. aphylla*, L., and a closer investigation may well prove it to be only a variety or form of it. *Seidlitzia florida*, M.B., is distributed from the salty steppes of Transcaucasia through North-Western Persia beyond Isaphan, where I saw it frequently in the desert on the lower Sajende Rua and in the Garokhane.

With regard to the statement that the material makes with boiling water a sort of lather I am inclined to suggest that it only does so in the presence of raw sheep wool, in which case the potash of the plant and the grease of the wool would naturally form a soap, thus producing a lather.

O. Stapf.

Research in Jodrell Laboratory in 1903 :—

Boodle, L. A.—Comparative Anatomy of the Hymenophyllaceæ, Schizaeaceæ, and Gleicheniaceæ. IV. Further Observations on *Schizaea*. (Ann. Bot., Vol. XVII., pp. 512–537, with three Figs. in text.)

Boodle, L. A.—On Descriptions of Vascular Structures. (New Phytologist, Vol. II., pp. 107–112.)

Fritsch, F. E.—Algological Notes. IV. Remarks on the periodical Development of the Algae in the Artificial Waters at Kew. (Ann. Bot., Vol. XVII., pp. 274–278.)

Fritsch, F. E.—Further Observations on the Phytoplankton of the River Thames. (Ann. Bot., Vol. XVII., pp. 631–647.)

Fritsch, F. E.—Two Fungi parasitic on Species of *Tolypothrix* (*Resticularia nodosa*, Dang., and *R. Boodlei*, n. sp.). (Ann. Bot., Vol. XVII., pp. 649–664, t. 29.)

Fritsch, F. E.—Observations on the young Plants of *Stigeoclonium*, Kütz. (Beihefte zum Botanischen Centralblatt, Vol. XIII., pp. 368–387, tt. 11 and 12.)

Pearson, H. H. W.—On some species of *Dischidia* with double Pitchers. (Journ. Linn. Soc., Vol. XXXV., pp. 375–390, t. 9.)

Salmon, E. S.—A Monograph of the Genus *Streptopogon*, Wils. (Ann. Bot., Vol. XVII., pp. 107–150, tt. 8–10.)

Salmon, E. S.—Infection-Powers of Ascospores in Erysiphaceæ. (Journ. Bot., Vol. 41, pp. 159–165 and 204–212.)

Scott, D. H.—The Origin of Seed-bearing Plants, pp. 1–14. A Lecture delivered at the Royal Institution of Great Britain on May 15, 1903.

Oliver, F. W., and Scott, D. H.—On *Lagenostoma Lomaxi*, the Seed of *Lyginodendron*. (Ann. Bot., Vol. XVII., pp. 625–629.)

Worsdell, W. C.—Abnormal "Flowers" of *Helenium autumnale*, L. (Journ. Roy. Hort. Soc., Vol. XXVII., pp. 943–955, with ten Figs. in text.)

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